

U.S. Application No.: 10/826,582
AMENDMENT C
Reply to Office action dated 05/10/2006

ATTORNEY DOCKET NO.: 3926.081

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-20. (cancelled)

21. (currently amended) A casting mold for metallic foundry or for precision casting of fine metal parts,

wherein the casting mold, or at least a part thereof, is produced by a generative rapid prototyping process, and is mainly comprised of a porous ceramic in the green or sintered state,

wherein the thermal coefficient of expansion of the ceramic is above approximately $8.5 \times 10^{-6} \text{K}^{-1}$ ~~$7.5 \times 10^{-6} \text{K}^{-1}$~~ and the ceramic is comprised of coated ceramic coarse particles and sinterable ceramic fine particles wherein the sintering temperature of the fine particles is at least 50°C below that of the coarse particles.

22. (currently amended) [[A]] The casting mold according to Claim 21, wherein the average particle size of the coarse particle is above 10 μm , the average particle size of the fine particles is below 5 μm , and the average particle size of the large particles is at least the 10 fold of the average particle size of the fine material.

23. (currently amended) [[A]] The casting mold according to Claim 21, wherein the casting mold includes reinforcing ribs produced using a generative rapid prototyping process.

24. (currently amended) [[A]] The casting mold according to Claim 21, wherein, at least during casting, the casting mold is back-fed with a fill of ceramic material.

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25. (currently amended) [[A]] The casting mold according to Claim 21, wherein the generative prototyping process is 3D-binder printing or 3D-laser sintering.
26. (currently amended) [[A]] The casting mold according to Claim 21, wherein the porous ceramic includes as main component aluminum oxide, zirconium oxide, magnesium silicate, spinel and/or magnesium oxide.
27. (currently amended) [[A]] The casting mold according to Claim 21, wherein the porous ceramic includes 0.5 to 10 wt.% organic binder.
28. (currently amended) A method for precision casting of metal alloys, comprising
selecting a metal or metal alloy to be cast,
determining the average thermal coefficient of expansion of said metal or alloy at foundry temperatures,
forming a green casting mold, said mold adapted for metallic foundry or for precision casting of fine parts, by a generative rapid prototyping process, wherein said mold is mainly comprised of a porous ceramic in the green or sintered state, wherein the thermal coefficient of expansion of the ceramic is above approximately $8.5 \cdot 10^{-6} \text{K}^{-1}$ ~~$7.5 \cdot 10^{-6} \text{K}^{-1}$~~ and wherein the ceramic is comprised of coated ceramic coarse particles and sinterable ceramic fine particles, wherein the sintering temperature of the fine particles is at least 50°C below that of the coarse particles,
optionally sintering said mold,
casting metal into said green or sintered mold to form metal parts,
wherein the mold material is selected such that the average thermal coefficient of expansion of the mold material in contact with said metal is approximately that of the metal or alloy being cast, and over the temperature interval of 0 to 800°C, is in the range of 5 to $14 \cdot 10^{-6} \text{K}^{-1}$.

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29. (currently amended) [[A]] The method for casting molds according to Claim 28, wherein said metal or alloy is cast by ingot casting, shell casting or precision casting, and wherein said metal or alloy is selected from the group consisting of steel and Fe/Ni- or Fe/Ni/Co- or Ni-alloys.
30. (currently amended) A process for producing a green casting mold for metallic foundry or for precision casting of fine metal parts, wherein the casting mold is produced by a generative rapid prototyping process and is mainly comprised of a porous ceramic in the green or sintered state, wherein the thermal coefficient of expansion of the ceramic is above approximately $8.5 \times 10^{-6} \text{K}^{-1}$ ~~$7.5 \times 10^{-6} \text{K}^{-1}$~~ and that the ceramic is comprised of coated ceramic coarse particles and sinterable ceramic fine particles, wherein the sintering temperature of the fine particles is at least 50°C below that of the coarse particles, and wherein said process comprises repeating sequence of the steps:
- a) applying a layer of particles, using a dispensing device, onto a substrate;
 - b) flattening the applied layer with a flatten device;
 - c) hardening the layer in defined areas
 - by adhering the particles under the influence of binder liquid,
 - or by melting or sintering the particles under the influence of intensive radiation,
- wherein the majority of the particles have an average thermal coefficient of expansion of above approximately $8.5 \times 10^{-6} \text{K}^{-1}$ ~~$7.5 \times 10^{-6} \text{K}^{-1}$~~ , wherein the ceramic is comprised of coated ceramic coarse particles and sinterable ceramic fine particles, and wherein the sintering temperature of the fine particles is at least 50°C below that of the coarse particles.
31. (currently amended) [[A]] The process according to Claim 30, wherein at least the coarse particles are coated with organic polymers.
32. (currently amended) [[A]] The process according to Claim 30, wherein the green casting mold is converted into a porous casting mold by ceramic firing.

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33. (currently amended) [[A]] The process according to Claim 30, wherein in the green or ceramic casting mold at least one mold core and/or insert of green and/or fired ceramic is employed based on MgO, ZrO₂, spinel, and/or Al₂O₃.
34. (currently amended) [[A]] The process according to Claim 30, wherein the green casting mold is a mold core or insert, which while in the green or fired state is inserted or introduced into a support or casing mold, whereby an composite casting mold is formed.
35. (currently amended) [[A]] The process according to Claim 30, wherein the casing mold includes foundry sand based on SiO₂, silicates or zircon.
36. (currently amended) A powder mixture for producing inserts for cast molds for metallic foundry or for precision casting of fine parts, ~~wherein said powder mixture includes~~ comprising coated ceramic coarse particles and sinterable ceramic fine particles, wherein the sintering temperature of said fine particles is at least 50°C below that of the coarse particles, and the thermal coefficient of expansion of the mixture is above approximately $8.5 \times 10^{-6} \text{K}^{-1}$.
37. (currently amended) [[A]] The powder mixture according to Claim 36, wherein the coating is comprised essentially of polymers which are readily soluble in organic solvent.
38. (currently amended) [[A]] The powder mixture according to Claim 36, wherein the ceramic coarse particles include oxides of the elements Mg, Al and/or Zr, and the ceramic fine particles are comprised essentially of SiO₂, and/or silicates.
39. (currently amended) [[A]] The process according to claim 30, wherein said casting is a tool or tool component for die casting, injection molding or forging machines.

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40. (currently amended) [[A]] The process according to claim 30, wherein said casting is a tool or tool component having cooling channels.